

# Quality Safety Meeting Process

## Heat Stress Prevention



Course Code – QS97

### SAFETY MEETING PACKAGE

#### TOPIC:

**Preventing Illnesses  
Due to Heat Stress**

**May, 2014**

This information is provided to assist supervisors in refocusing our safety efforts.

#### CONTENTS:

Leader's Guide



## Leader's Instructions

### Approximate Time: 1 Hour

- The expectation is that each manager or supervisor will conduct this QSM training with all of their employees by **June 15th**.
- Each participant's PINS record will be updated with **QS97**.
- Don't just read the QSM to your employees. Read it beforehand so that you are familiar with it. Use local examples to reinforce the key messages. Make this your message.

### Preparation

Before the safety meeting, you will need to read and be familiar with this QSM. Also, be familiar with and reference the Safety Resource Manual, Section N "Heat Stress Prevention Program".

### Introduction

The primary purpose of this QSM session is to reduce the occurrence of heat stress illnesses while performing our work.

Most of us work outside for a good portion of every day - regardless of the weather. Working outside is one of the benefits of our job since most of us don't like being cooped-up indoors. However, along with working outside comes the risk of injury or illness when Mother Nature gives us a little more weather than we would like. Just as we have to take steps to avoid the risks of frostbite and hypothermia in the winter, we also must be aware of and take steps to avoid the risk of heat-related illnesses in the summer.

In the past five years, 30 Engineering employees have suffered heat related incidents; 16 of these were serious enough to be reportable and 11 resulted in lost time.

#### By Year

2009 – 5 inc.  
2010 – 10 inc.  
2011 – 4 inc.  
2012 – 8 inc.  
2013 – 3 inc.

#### By Month

June – 8 inc.  
July – 10 inc.  
August – 9 inc.  
Sept. – 3 inc.

#### By Region

Northern Region – 5 inc.  
Southern Region – 9 inc.  
Centralized Engr. – 16 inc.  
Structures/Maint – 2 inc.  
Track Programs – 13 inc.  
Design/Construction – 1 inc.

#### By Activity

Using Hand / Power Tools – 10  
Handling Material/Equipment – 8  
Walking, Stepping, Climbing – 6  
Operating Machinery – 4  
Other/Misc. – 2

We have several tools at our disposal to deal with the effects of hot weather. Most of these are common sense procedures and techniques that we learned long ago. By understanding what heat stress is and the effect it has on our body, we can better plan to prevent it. This



is why we require all Engineering employees to take Heat Stress Training (PINS Code PXBDE) every year. When we complete this training, we should be able to recognize the following:

- The different types of heat stress and their signs and symptoms,
- The environmental and personal risk factors related to heat stress,
- The importance of frequent water consumption in a hot work environment,
- The importance of acclimatization (getting used to the heat) when the work environment is hot, and
- The importance of notifying a supervisor when a co-worker shows signs or symptoms of heat stress.

This QSM was designed to build on the Heat Stress Prevention Training each of you has received and to provide guidance as to preventive measures to take when the temperature and humidity reach high levels. We will focus on five primary preventive measures in this QSM:

1. Personal Health Concerns
2. Fluid Replacement
3. Work Procedures
4. Environmental Procedures
5. Emergency Response

### **Personal Health Concerns**

All of the preventive measures and guidance issued to combat heat stress assume that the individual is in good health. Employees who are not in good health, suffer from one of many health-related diseases or take prescription medication may be at an increased risk of heat stress.

Each of us has a responsibility to take care of ourselves so that we can reduce the risk of injury or illness, which includes heat stress. These include:

- Regular Exercise. Since extreme heat makes your heart and lungs work harder than normal, regular exercise can help you to increase your body's ability to handle the heat by improving your cardiovascular fitness.
- Rest. Hot weather is hard on your body so you must give it time to recuperate. Allow yourself 8-9 hours of good sleep every night.
- Avoid Alcohol. Avoid drinking alcohol the evening before work during hot temperatures. If you choose to drink, do so in moderation and early in the evening.

Active prevention efforts can prevent most heat-related illness in healthy adults. The health conditions and medications listed below can interfere with the body's adaptation to heat stress.

If you have any of the health conditions/factors or take any of the medications listed below, talk to your health care provider about how these conditions or medications may affect you

when working in hot environments. Your health care provider may suggest medication changes or other precautions for working in hot environments.

### **HEALTH CONDITIONS – That can affect heat stress adaptation**

Cardiovascular disorders (heart disease);

- Hypertension (high blood pressure);
- Diabetes (type 1 and type 2);
- Respiratory (lung) disorders;
- Thyroid disorders and other metabolic disorders; and
- Recent vomiting, diarrhea or fever (of any cause)

### **OTHER HEALTH AND FITNESS FACTORS – That can affect heat stress adaptation**

- Obesity or being overweight (risk increases progressively above BMI of 27);
- Age (risk increases progressively above age 35);
- Lower levels of physical conditioning (low aerobic fitness); and
- Lack of heat acclimatization (it takes 2 weeks of work in heat to acclimate)

### **MEDICATIONS – That can affect heat stress adaptation**

#### **Prescription Drugs with increased potential for contributing to Heat Stress**

***(talk to your doctor to discuss if alternate medications may be used)***

- **Loop Diuretics** (commonly used for high blood pressure; “water pills” cause you to lose fluids and contribute to dehydration). Examples include furosemide (Lasix), ethacrynic acid (Edecrin), and bumetanide (Bumex). The safest diuretics, in terms of heat stress, for the treatment of high blood pressure are thiazide diuretics such as hydrochlorothiazide (HCT, Hydrodiuril).
- **Anticholinergic Drugs** (used for some gastrointestinal, neurologic, respiratory and urological disorders – can block the body’s heat regulating mechanisms). Common anticholinergic drugs that can interfere with heat regulation are those used to treat nausea and vomiting such as transdermal scopolamine (Transderm-Scop) or those used to treat diarrhea such as diphenoxylate plus atropine (Immodium).
- **Neuroleptics Drugs** (potent psychiatric drugs, also called “major tranquilizers”, often used for bipolar illness, sometimes for anxiety or sleep). Examples include aripiprazole (Abilify), ziprasidone (Geodon), risperidone (Risperdal), quetiapine (Seroquel) and olanzapine (Zyprexa).
- **Cardiovascular and Blood Pressure Drugs**
  - Alpha Adrenergics - example: clonidine
  - Beta Blockers - examples: metoprolol (Lopressor) and propranolol (Inderal)
  - Calcium Channel Blockers - examples: nifedipine (Procardia) and amlodipine (Norvasc)



- **Psychiatric Drugs**

- Amphetamines - prescribed for narcolepsy or ADHD - examples: dextro-amphetamine (Adderal) and methylphenidate (Ritalin)
- Benzodiazepines - examples: alprazolam (Xanax), diazepam (Valium) and temazepam (Restoril)
- Tricyclic Antidepressants - example: amitriptyline (Elavil)
- SSRI Antidepressants - example: sertraline (Zoloft)
- SNRI Antidepressants - example: duloxetine (Cymbalta)

- **Other Prescription Medications**

- Thyroid Replacement Drugs
- Laxatives – cause dehydration

- **Allergy and Cough/Cold Medications**

- Antihistamines - except newer non-sedating types such as loratadine (Claritin), fexofenadine (Allegra) and cetirizine (Zyrtec) which have lower risk of heat stress
- Decongestants – such as ephedrine and pseudoephedrine
- Cough Suppressants – such as dextromethorphan

- **Other Substances**

- Alcohol (consuming excess alcohol in the prior 24 hours leads to dehydration);
- Energy Drinks or Supplements (containing large amounts of caffeine)
- Illicit drugs especially amphetamines, cocaine and bath salts.

### **Fluid Replacement**

The most effective way to prevent heat-related illness is to come to work fully hydrated and stay hydrated throughout the work shift by frequent intake of appropriate fluids. When ambient temperatures exceed 85 degrees, employees are encouraged to drink at least 32 ounces of cool (not cold) water every hour to keep the body properly hydrated. Drink water pro-actively – before you feel thirsty. Drink 3 or 4 of the 10 fluid ounce-sized, UP-supplied, bottles of water every hour.

Studies of workers in hot environments have found that if a person comes to work well hydrated and drinks adequate fluids during the work shift, then the chance of suffering a heat-related illness is low. These studies found that almost all cases of heat-related illness at work occurred in workers who were already in a dehydrated state when they started work. Once a person becomes even moderately dehydrated, it can take up to 24 hours of consuming fluids and electrolytes to fully recover and return the body to a normal fluid-balanced state.

Even mild dehydration can lead to fatigue when performing physical work during hot weather. If dehydration progresses beyond a mild stage and the person continues to work in the heat, then fatigue increases and heat-related illnesses can develop.



One quick indicator of hydration is the color of a person's urine. If properly hydrated, it should be clear or nearly clear. The more dehydrated, the more yellow it becomes. Keep in mind, however, that some medications, vitamins and even diet can alter the color of a person's urine as well.

It is important to drink plenty of water during hot weather to replace fluids losses from sweating. Research has shown benefits from fluids that replenish the body's electrolytes (replaces salt lost from sweating) and carbohydrates (increases water absorption). Eating three good meals a day, and consuming energy snacks (such as protein bars) during the day, also helps to replace electrolytes and sustain energy levels. Fruit, fruit juices (without caffeine or sugar) and vegetable juices are also beneficial during hot weather. Employees may choose to bring electrolyte-containing sports drinks, such as Gatorade (or similar drinks) with them.

Avoid "energy" drinks that contain large amounts of caffeine, since these interfere with the body's ability to handle heat stress. Other caffeinated drinks such as soda, tea or coffee should be used in moderation during hot weather.

### **Work Procedures**

In hot weather, it is critical that we identify those specific tasks that require a lot of energy and rotate those jobs among employees. If working alone or other employees are not available for this job rotation, take frequent breaks to allow your body time to cool down and recover before going back to work.

Also remember that in hot weather even normal tasks can cause an individual to become overheated. Be sure to know and be on the lookout for the signs and symptoms of heat stress (from our annual training) and, if possible, implement a "Buddy System" during the hot weather. This means having two employees each responsible for watching the other for signs of heat stress - reminding each other to drink water, suggesting a task rotation or taking a break. Supervisors must pay special attention to new hires or others not used to working in the heat for at least 2 weeks until they become acclimated to the heat.

Wear lightweight, light colored, loose-fitting clothes; wearing clothing reduces the body's ability to lose heat into the air. When air temperature is higher than skin temperature, clothing helps to prevent the transfer of heat from the air to the body. However, this advantage may be nullified if the clothes interfere with the evaporation of sweat. In dry climates, adequate evaporation of sweat is seldom a problem.

In a dry work environment with very high air temperatures, protective clothing could be an advantage to the worker. The proper type of clothing depends on the specific circumstance.

However, we must be aware that the PPE we use can cause us to react more rapidly to the heat. Disposable Tyvek® suits, welding jackets, respirators, rain suits and similar items can



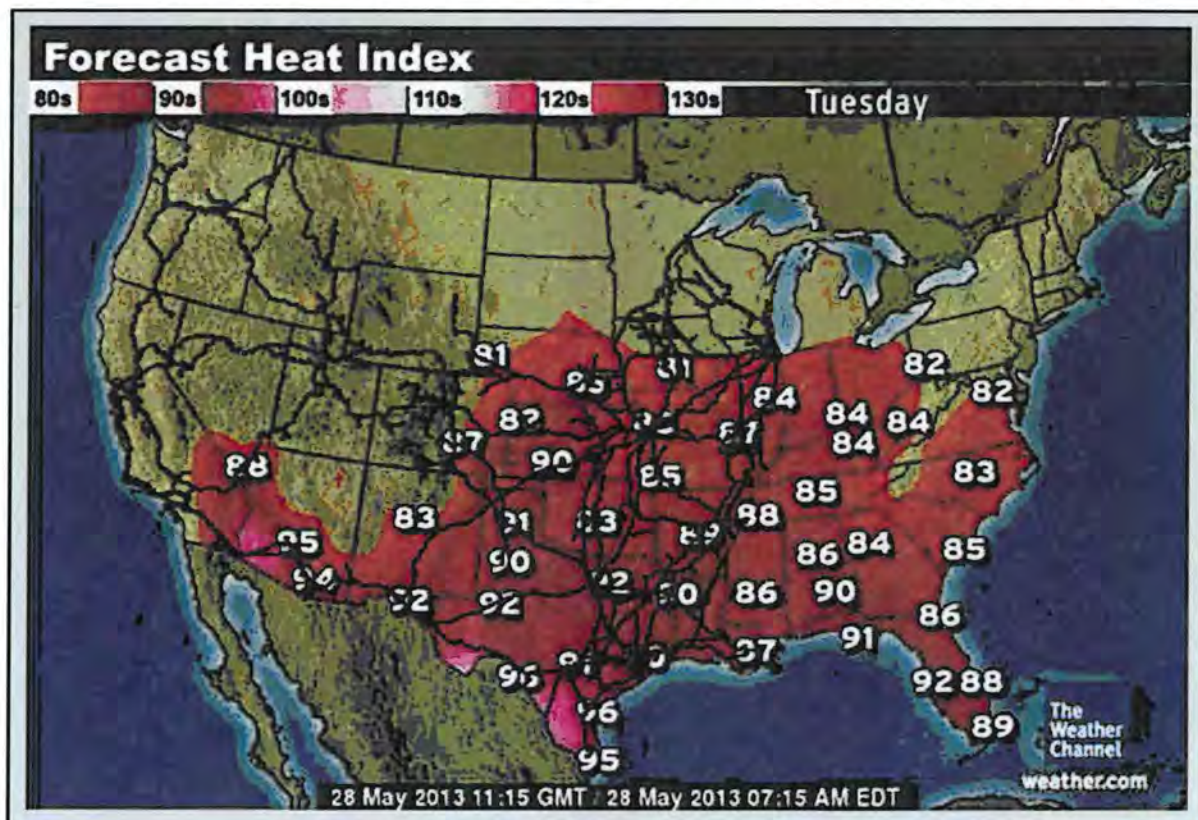
cause the body to heat more rapidly than normal. We have PPE in store stock that can help us stay cool, such as MiraCool vests, ISOTHERM vests and MiraCool Bandannas.

Consult the PPE catalog for additional information on items designed to cool the body.

| UP SUPPLY<br>STOCK NUMBER | DESCRIPTION  |
|---------------------------|--|
| 38379800                  | MiraCool Vest, Hi-Vis Orange                             |
| 38366600                  | MiraCool Cooling Pad for Hard Hat, Blue                  |
| 38366540                  | MiraCool Bandanna, Collar with Hook and Loop, Blue Denim |
| 38395200                  | MiraCool Bandanna, Tie, Blue Denim                       |
| 38381950                  | ISOTHERM Cooling Vest (Large) with 2 Cooling Packs       |
| 38381950                  | ISOTHERM Cooling Vest (X-Large) with 2 Cooling Packs     |
| 38381900                  | ISOTHERM Cooling Packs for Vest, 2 EA                    |

### Environmental Measures

In order to put the proper heat stress prevention measures in place, we'll need to know how hot it is actually going to be. Ambient (air) temperature and humidity, taken together, create a heat index - similar to the wind chill index in the winter. Appendix A shows the heat index at a given ambient temperature and relative humidity level. The anemometers we furnished to engineering gangs to determine our fire risk level can and should be used to determine these two factors. Weather forecasts or websites are a good source of this information. A map showing the Forecast Heat Index is on the Engineering Home Page (shown below).





Once we determine the heat index, we will know whether to use the General Heat Stress Prevention Measures (Appendix B), the High Heat Procedures (Appendix C) or the Extreme Heat Procedures (Appendix D).

Other environmental factors that can influence the level of heat we experience include:

- Radiant heat (from open flame or other heat producing sources)
- Conductive heat (rail, ties, rock and other materials that can absorb, retain and give off heat),
- Extended periods of hot weather (i.e. – heat waves).
- Movement of air (even slight winds can move enough air to help cool our bodies).

### **Emergency Response**

Our Emergency Response Plans have been and will continue to be an excellent planning tool for responding to critical or emergency situations. As mentioned before, it is important that everyone knows the signs and symptoms of heat stress and knows what to do should a co-worker experience those signs or symptoms.

If we recognize the early signs of heat stress in ourselves or one of our co-workers, the remedy may be as simple as taking a break in the shade (if any) or an air-conditioned vehicle and drinking water to allow our bodies to cool. If the heat stress appears to be more severe, don't hesitate in seeking immediate medical attention.

#### **A. Symptoms and Signs of Heat Exhaustion**

- Headache
- Dizziness
- Weakness
- Flushing of the skin

#### **ACTIONS to take if this occurs**

- Get person in shade, start cooling, give fluids
- Seek medical attention if symptoms do not improve in 15-20 minutes

#### **B. Symptoms and Signs of Possible Heat Stroke**


- Confusion, Decrease in Consciousness or Extreme Irritability
- Nausea
- Vomiting
- Person Stops Sweating (warm dry skin)

#### **ACTIONS to take if this occurs**

- This is a Medical Emergency! Call 911 or immediately transport to an Emergency Room
- Get in shade and air conditioned vehicle
- Place cold wet towels or ice packs, if available, around upper trunk, under arm pits, on forehead or behind the neck for cooling.




The "Preventing Heat Stress" poster (PB-26054) is available through E-Procurement.




# PREVENTING HEAT STRESS

## Engineering Department




### Personal Health – Take Care of Yourself!

1. Exercise regularly to help your body handle the heat.
2. Get sufficient rest to allow your body to recuperate from the heat.
3. Avoid alcohol – it makes your body work harder to stay cool.
4. Be aware that your medical condition or other fitness factors can affect you in hot weather.
5. Be aware that medications you take can affect your ability to handle the heat.




### Fluid Replacement

1. Come to work well hydrated.
2. During hot weather, drink 32oz of cool water per hour (3 – 4 UP water bottles).
3. Drink water pro-actively – don't wait until you get thirsty.
4. Avoid energy drinks that contain large amounts of caffeine.




### Work Procedures

1. Rotate strenuous jobs – especially as the temperature rises.  
If possible, schedule these tasks for the cooler parts of the day.
2. Remember to take frequent breaks during the heat.
3. Monitor new workers for the first 2 weeks until they become acclimated to the heat.
4. Use company-approved PPE to help keep cool.



### Environmental Procedures

1. Know the heat index – temperature + humidity.
  - Communicate the forecasted heat index in the morning job briefing.
  - A link for the forecasted heat index can be found on the Engineering Home Page.
  - Monitor the actual heat index during the day and make adjustments in the work procedures as necessary.
2. Know the high heat procedures:
  - Take at least a 5 minute break every hour. In CA, breaks must include access to shade or air conditioned vehicles.
  - Use the Buddy System to watch out for each other.



### Emergency Response

1. Review your Emergency Response Plan at each job briefing.
2. Recognize the early signs of heat stress (for yourself and others).
3. Have a communication system in place to alert others.

**PB-26054**



## APPENDIX A

### Heat Index Table

The Heat Index Table below is a measure of how hot it really feels when the humidity is factored in with the air temperature. Follow the column down under "Air Temperature (°F)" until meeting with the row for the "Relative Humidity (%)". The number indicated is the Heat Index or "feels like" temperature. When a temperature or humidity reading is between two values shown on this chart, use the next highest value. For example, if the temperature is 91°F and the humidity is 62%, use the 92°F column and the 65% row.

# AIR TEMPERATURE (°F)

RELATIVE HUMIDITY (%)

|     | 76 | 78 | 80 | 82 | 84  | 86  | 88  | 90  | 92  | 94  | 96  | 98  | 100 | 102 | 104 | 106 | 108 | 110 |
|-----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 10  | 75 | 77 | 78 | 79 | 81  | 83  | 84  | 86  | 87  | 89  | 91  | 93  | 95  | 97  | 99  | 101 | 103 | 105 |
| 15  | 76 | 77 | 78 | 80 | 81  | 83  | 84  | 86  | 88  | 90  | 92  | 94  | 96  | 98  | 100 | 103 | 105 | 108 |
| 20  | 76 | 77 | 79 | 80 | 81  | 83  | 85  | 86  | 88  | 90  | 93  | 95  | 97  | 100 | 103 | 106 | 109 | 112 |
| 25  | 77 | 78 | 79 | 80 | 82  | 83  | 85  | 87  | 89  | 92  | 94  | 97  | 100 | 103 | 106 | 109 | 113 | 117 |
| 30  | 77 | 78 | 79 | 80 | 82  | 84  | 86  | 88  | 90  | 93  | 96  | 99  | 102 | 106 | 110 | 114 | 118 | 122 |
| 35  | 78 | 78 | 80 | 81 | 83  | 85  | 87  | 89  | 92  | 95  | 98  | 102 | 106 | 110 | 114 | 119 | 123 | 129 |
| 40  | 78 | 79 | 80 | 81 | 83  | 85  | 88  | 91  | 94  | 97  | 101 | 105 | 109 | 114 | 119 | 124 | 130 | 136 |
| 45  | 78 | 79 | 80 | 82 | 84  | 87  | 89  | 93  | 96  | 100 | 104 | 109 | 114 | 119 | 124 | 130 | 137 |     |
| 50  | 78 | 79 | 81 | 83 | 85  | 88  | 91  | 95  | 99  | 103 | 108 | 113 | 118 | 124 | 131 | 137 |     |     |
| 55  | 78 | 79 | 81 | 84 | 86  | 89  | 93  | 97  | 101 | 106 | 112 | 117 | 124 | 130 | 137 |     |     |     |
| 60  | 78 | 80 | 82 | 84 | 88  | 91  | 95  | 100 | 105 | 110 | 116 | 123 | 129 | 137 |     |     |     |     |
| 65  | 78 | 80 | 82 | 85 | 89  | 93  | 98  | 106 | 108 | 114 | 121 | 128 | 136 |     |     |     |     |     |
| 70  | 78 | 80 | 83 | 86 | 90  | 95  | 100 | 105 | 112 | 119 | 126 | 134 |     |     |     |     |     |     |
| 75  | 77 | 80 | 84 | 88 | 92  | 97  | 103 | 109 | 116 | 124 | 132 |     |     |     |     |     |     |     |
| 80  | 77 | 80 | 84 | 89 | 94  | 100 | 105 | 113 | 121 | 129 |     |     |     |     |     |     |     |     |
| 85  | 77 | 80 | 85 | 90 | 96  | 102 | 109 | 117 | 126 | 135 |     |     |     |     |     |     |     |     |
| 90  | 76 | 80 | 86 | 91 | 96  | 105 | 113 | 122 | 131 |     |     |     |     |     |     |     |     |     |
| 95  | 75 | 81 | 86 | 93 | 100 | 108 | 117 | 127 |     |     |     |     |     |     |     |     |     |     |
| 100 | 75 | 81 | 87 | 95 | 103 | 112 | 121 | 132 |     |     |     |     |     |     |     |     |     |     |

AS AN EXAMPLE –  
THE HEAT INDEX IS 134°F FOR  
AN AIR TEMPERATURE OF 98°F  
AT 70% RELATIVE HUMIDITY

AS AN EXAMPLE –  
THE HEAT INDEX IS 134°F FOR  
AN AIR TEMPERATURE OF 98°F  
AT 70% RELATIVE HUMIDITY

- General Heat Stress Prevention Measures to be implemented
- High Heat Procedures to be implemented
- Extreme Heat Procedures to be implemented



## APPENDIX B

### General Heat Stress Prevention Measures

General Heat Stress Prevention Measures outlined below will be initiated when the heat index is in the yellow as shown on the Heat Index Table (Appendix A). Also, use these measures for employees wearing Tyvek® suits, welding jackets or similar PPE when temperature is higher than 52°F. Supervisors will:

- Ensure employees have taken their Heat Stress Prevention Training (PXBDE). If employees have not taken this training, review this QSM prior to starting work.
- Ensure that employees have access to potable drinking water. Where drinking water is not plumbed or otherwise continuously supplied, it shall be provided in sufficient quantity at the beginning of the work shift to provide one quart (32 oz.) per employee per hour for drinking for the entire shift. The shift may begin with smaller quantities of water if the supervisor(s) have effective procedures for replenishment during the shift as needed to allow employees to drink one quart or more per hour.
- Remind employees throughout the work shift to drink plenty of water.
- Observe employees for alertness and signs or symptoms of heat illness.
- Reinforce the importance to employees of immediately reporting directly or through their supervisor, symptoms or signs of heat illness in themselves or co-workers.
- Ensure that effective communication by voice, observation, or electronic means is maintained so that employees can contact a supervisor when necessary.
- Reinforce UPRR procedures for responding to symptoms of possible heat illness, including how emergency medical services will be provided should they become necessary.
- Reinforce UPRR procedures for contacting emergency medical services and, if necessary, transporting employees to a point where they can be reached by an emergency medical service provider.
- Reinforce UPRR procedures for ensuring that, in the event of emergency, clear and precise directions to the work site can and will be provided as needed to emergency responders.

## APPENDIX C

### High Heat Procedures

High Heat Procedures will be initiated when the heat index is in the **orange** as shown on the Heat Index Table (Appendix A) or when ambient temperature is above 85°F for those employees working in California. In addition to the Heat Stress Prevention Procedures in Appendix B, supervisors will:

- Ensure that all employees exposed to the high heat take a rest break for at least 5 minutes every hour.

Note: In California, these breaks must be permitted in the shade or air-conditioned vehicles or equipment. Supervisors must provide enough shade or as many air-conditioned vehicles and equipment to accommodate 25% of the employees at any one time. The shade or air-conditioned vehicles or equipment must be accessible within 5 minutes of the work site.

- Provide for close supervision of a new hire or newly assigned employee's acclimation for the first 14 days of the employee's work. During this period, expose them to the heat for progressively longer periods of time or reduce the physical demands of the employee until they become acclimated to the heat. This supervision may be assigned to another employee.
- On larger gangs or where the work is spread over an extended distance, the designation of a "buddy" for each employee must be discussed in the job briefing.
- When practicable, schedule work in hot areas for cooler months and/or cooler parts of the day.

## APPENDIX D

### Extreme Heat Procedures

Extreme Heat Procedures will be initiated when the heat index is in the **red** as shown on the Heat Index Table (Appendix A). In addition to those procedures in Appendix B and C, supervisors will ensure that all employees exposed to the extreme heat take a rest break for at least 15 minutes every hour. Employees should also take advantage of shade, forced air or air-conditioned vehicles or equipment if they are available.



## Topical Planning Guide

### **S**tate Topic

Procedures for preventing heat stress illnesses during the hot weather.

### **A**nnounce Purpose

Review causes of heat stress and the procedures that must be implemented depending on the temperature and humidity.

### **F**ocus Discussion

Discuss the practical application of these preventive actions in the employees' work environment. Discuss the differences in preventive measures taken for General Heat Stress Prevention, High Heat Procedures and Extreme Heat Procedures.

### **E**xplore Actions

Through discussion and questioning, ensure employees' understanding of the causes of heat stress and the preventive measures that must be taken to prevent it. Also, ask employees what we can do in addition to the required preventive measures to reduce the chance of a heat stress illness.

### **T**aking Commitment

Ask for the employees' commitment to be on the lookout for early signs of heat stress among their co-workers and take the preventive actions to mitigate those risks.

### **Y**our Summary

Encourage employees to take the risk of heat stress seriously, regardless of their past history; know and understand the causes of heat stress; and know how to apply the preventive measures based on the heat index.